What is claimed is:

1. An antenna array system, comprising:

an antenna array which includes a plurality of antenna elements;
a signal detection section which detects base station signals
including desired signals and interference signals from among received signals
received by the respective antenna elements;

a control section which selects one or more desired signals and one or more interference signals to be cancelled from detected signals;

a spatial signature detection section which detects spatial signatures of the desired signals and the interference signals to be cancelled from the received signals;

a virtual-signal generation section which generates one or more virtual-signals, the number of which is equal to the number of interference signals to be cancelled, based on the spatial signature of the interference signals to be cancelled;

an array weight generation section which generates array weights for the respective antenna elements based on the virtual-signals and the spatial signatures of the desired signals; and

a signal combining section which performs weighting for the received signals received by the respective antenna elements using the array weights and combines the weighted received signals to output a resultant combined signal.

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- 2. An antenna array system according to claim 1, wherein the control section selects the desired signals and the interference signals to be cancelled based on signal levels of the detected signals.
- 3. An antenna array system according to claim 1, wherein the spatial signature detection section detects signal phases at the respective antenna elements as the spatial signatures.
- 4. An antenna array system according to claim 1, wherein the array weight generation section generates the array weights for the respective antenna elements by performing multiplication of an inverse matrix of a correlation matrix of the virtual-signals by the respective spatial signatures of the desired signals and by combining the results of the multiplication.
- 5. An antenna array system according to claim 1, wherein the spatial signature detection section detects the spatial signatures by performing correlation operations between the received signals and a spreading code which has been generated locally.
- 6. An antenna array system according to claim 1, further comprising a scaling section which adjusts amplitudes of the spatial signatures output from the spatial signature detection section so that the adjusted amplitudes fall within a predetermined range.
- 7. An antenna array system according to claim 1, wherein the virtual-signal generation section generates signals which are uncorrelated with each other as the virtual-signals.

9500408.1 29

- 8. A mobile terminal, comprising the antenna array system according to claim 1.
- 9. A mobile terminal, comprising the antenna array system according to claim 2.
- 10. A mobile terminal, comprising the antenna array system according to claim 3.
- A mobile terminal, comprising the antenna array system according to claim 4.
- 12. A mobile terminal, comprising the antenna array system according to claim 5.
- 13. A mobile terminal, comprising the antenna array system according to claim 6.
- 14. A mobile terminal, comprising the antenna array system according to claim 7.
- 15. A method of controlling the directivity pattern of an antenna array comprising a plurality of antenna elements which is provided in an antenna array system which combines received signals received by the respective antenna elements to output a combined signal, the method comprising:

a signal detection step which detects base station signals including desired signals and interference signals from the received signals;

a control step which selects one or more desired signals and one or more interference signals to be cancelled from detected signals;

a spatial signature detection step which detects spatial signatures of the desired signals and the interference signals to be cancelled from the received signals;

a virtual-signal generation step which generates virtual-signals, the number of which is equal to the number of interference signals to be cancelled, based on the spatial signatures of the interference signals to be cancelled;

an array weight generation step which generates array weights for the respective antenna elements based on the virtual-signals and the spatial signatures of the desired signals; and

a signal combining step which performs weighting for the received signals using the array weights and combines the weighted received signals to generate the combined signal.